Unit (1)

Lesson (1)

Mass and Weight

A) Mass:-

The amount of matter in an object.

The mass is measured by gram, kilogram and Ton.

<u>Note:</u>

The mass of the object differs according to the amount of matter found in the object.

One kilogram = 1000 grams.

One ton = 1000 kilograms.



Mass Measurement:-

The mass is measured by different scales:-

1) *The balance scale.*
2) *Sensitive two arm scale.*
3) *One arm digital scale.*
4) *One arm scale with a pointer.*





Notes:-

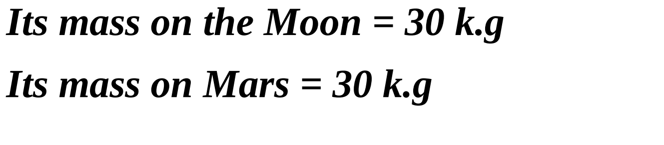
1- The scale is chosen to match the amount of matter we need to measure the mass.

The grocers use the balance scale, while the gold is measured by digital scale.

2- The object mass is equal to the total mass of balance masses that are known.

The properties of mass:-

1) **Mass doesn't change from one place to another. The mass of the object is stable whatever it is. Mass is definite**


If the mass of the body on Earth = 30 k.g

Its mass on the Moon = 30 k.g

Its mass on Mars = 30 k.g


2) **The mass has no direction**


Notes:-



a) The gram may equal to the mass of one paper clip.

b) The kilogram is equal to the mass of a liter of distilled water.

c) One liter = 1000 gm

d) Half liters = 500 gm


B) The Weight



The force with which a body is attracted to the Earth.

The weight is a force its direction is towards the center of the Earth.

The measuring unit of the weight is Newton.

The weight is measured by the <u>spring scale.</u>

Define Newton:-

The measuring unit of weight, it's equal to the weight of object it's mass = 100 gm

Factors affecting the weight:-

1) The mass of the object:-

The weight of an object increases according to the increase in the mass.

Weight = mass (k.g) x 10

To calculate the weight, the mass must be measured by kilogram.

Examples:-

a) An object its mass = 6 k.g, calculate its weight.

Solution;-

The weight = mass x 10

The weight = 6x10 = 60 Newton.

b) The mass of amount of milk = 300 gm, calculate its weight.

Weight = mass (k.g) x 10

Mass = $\frac{300}{1000} = 0.3k.g$

Weight = 0.3x10 = 3 Newton.

2) The planet where the object exists;-

Due to the difference in gravitational force of the planet or the moon, the weight changes.

As the mass of the planet increases the gravitational force increases and weight increases

Object's weight on the moon = $\frac{object weight on earth}{6}$

Object's weight on Earth = object weight on moon x 6

Examples:-

a) an object its mass on = 6 k.g, calculate:

I. **The mass on the moon.**
II. **The weight on Earth**
III. **The weight on the moon.**

The answer:-

I. **mass on the moon = the mass on Earth = 6k.g**

II. **The weight on Earth = mass (k.g) x 10 = 6x10 = 60 Newton.**

III. **Weight on the moon =** $\frac{weight on earth}{6} = \frac{60}{6}$ **= 10 Newton.**

b) An object its weight = 360 Newton, calculate;-

I) **Its mass on Earth.**

II) **Its weight on the moon.**

The answer:-

Mass on = $\frac{weight on earth}{10} = \frac{360}{10}$ **= 36 k.g**

Its weight on the moon = $\frac{weight on earth}{6} =$ **= 60 Newton**

3) Distance from the center of the planet:-



As the body moves away from the Earth center, the gravitational force decreases and the weight decreases. The difference in weight it little.

Example;-

A person in a balloon flies has a weight less than his weight on Earth surface.

Compare between mass and weight:-

Point of comparison	Mass	Weight
Definition	The amount of matter in the object.	The force with which the body is attracted to the Earth.
The unit of measurement	Kilogram or gram	Newton
Device of measurement	A balance scale	A spring scale
Direction	Has no direction	Towards the center of the Earth.
Effect of different places	Constant Doesn't change with the change in the place	Changes from a planet to another.

Unit (2) Thermal Energy

Lesson (1) Heat Conduction

Heat is one of energies used in our life.

Uses of heat:

A) We use heat at home such as:-

1- Warming the house. *2- Cooking.*

3- Heating of water. *4- Drying washed clothes.*

B) In industry:-

1- It is used in making and processing food. *2- Glass.*

3- Paper. *4- Textiles.*

Heat

It is a form of energy that transfers from the higher temperature object to the lower temperature object.

Temperature:-

It is the degree of hotness or coldness of a body.

We measure the temperature by thermometers.

Good and bad conductors of heat

The different materials such as (plastic, wood and aluminum) differ in conducting heat.

Elements and heat conduction

Activities to show the ability of elements to conduct heat:

Steps	Observation	Conclusion
Set up as the shown apparatus.	*-The button falls from the metallic spoon.* *- The button doesn't fall down in case of the ruler and the pencil.*	*Materials are different in conducting heat.*

Classification of materials according to conduct heat

Comparison	Good conductors	Bad conductors (insulators)
Definition	✓ *Materials that conduct heat and let heat flow through.*	✓ *Materials that don't let heat flow through.*
Examples	✓ *Copper, Aluminum, and Iron*	✓ *Wood, Plastic, Glass, Paper, Liquid and Gases {Air}*
Uses	✓ *Aluminum, Copper and Stainless steel are used to make cooking pots and kettles in houses and factories.*	✓ *Plastic and Wood are used to make handles of cooking pots, handles of kettles and iron.* ✓ *Heavy blankets and wool clothes are used in winter to keep the body warm and prevent the leakage of heat.*

❖ *Copper conducts heat faster than aluminum and iron.*

Life applications:-

✓ **Air is a bad conductor of heat.**

Air is used in making insulating glass windows.

The window is made by bonding 2 sheets of glass and maintaining a space between them filled with air to prevent leakage of heat.

Lesson (2)

Measuring Temperature

The importance of measuring temperature:-

1- Helping us to measure the body temperature.

2- Helping us to know the weather temperature which affects our life skills.

3- Food industries require a certain temperature.

- *By touching any object we find out if an object is hot or cold.*

Give reason:

✓ **We can't use touching in measuring temperature?**

Because the sense of touching helps us to discover if the object is hot or cold but it can't measure the temperature.

☒ **Measuring the temperature by using thermometer.**

Thermometer:

It is a device that is used to measure the temperature.

☒ The scientific principle that thermometers work on is:-

Changing the volume of the liquid according to the temperature.

- **Liquids expand by heating and contract by cooling.**

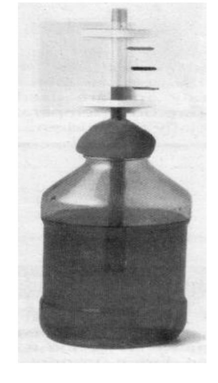
Note:-

Any matter (solid – liquid or gas) expands by heating and contracts by cooling.

In the next figure:-

When the liquid is heated it expands and rises up.

When the liquid gets cold it contracts.



A. A small space is left between the sections of railway tracks.
To allow the metal tracks to expand in hot weather, and prevent bending.

Types of Thermometers

1- Medical thermometer. **2- Celsius thermometer.**

A) Medical thermometer:-

Uses:-

Measuring the temperature of the human body.

The structure

1- A transparent glass tube which includes a capillary closed from one of its ends.

2- The other end from the capillary tube is connected to a bulb filled with mercury.

3- There is a constriction above the bulb. {G.R}

To prevent mercury to go back to the bulb quickly before reading the temperature.

- ✓ ***The thermometer scale starts from 35 C to 42 C.***
- ✓ ***Every degree is divided into ten parts.***



Steps to measure the human temperature:-

1- Sterilize the medical thermometer using ethyl alcohol.

2- Dry the thermometer very well using a paper tissue.

3- Shake the thermometer well until mercury goes back to the bulb.

4- Put the thermometer under the tongue for a minute.

5- Record the reading.

6- Sterilize the thermometer using ethyl alcohol.

7 - Put it in its box.

B) Celsius thermometer:

It consists of:

- ✓ ***A transparent glass tube with a capillary tube closed from one of its ends.***
- ✓ ***The other end of the capillary tube is connected to a bulb filled with mercury, but there is no constriction above the bulb.***
- ✓ ***The thermometer scale starts from zero Celsius until 100 degrees Celsius. Every degree is divided into ten parts.***

Give Reasons

☒ **The presence of a constriction (narrow passage) in the glass canal of the clinical thermometer.**

Because: this constriction prevents the mercury from going back to the bulb in order to read the temperature.

☒ **The scale of the clinical thermometer is graduated from 35‘C to 42’C .**
Because the normal body temperature of human is 37'C and it never below 35'C or exceeds 42'C.

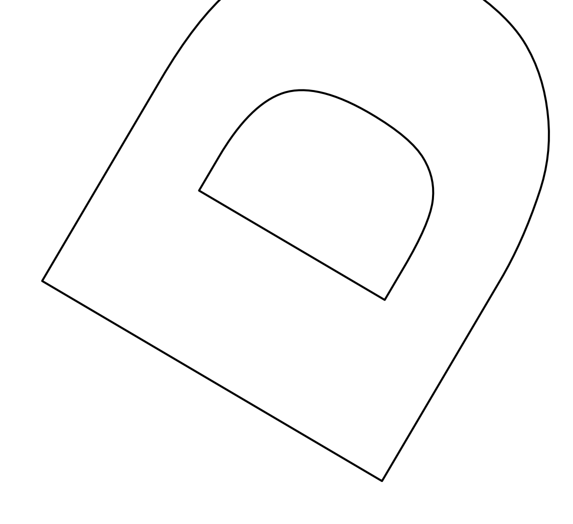
☒ **Thermometers should be kept away from children.**
Because mercury is a poisonous material.

☒ **We should shake the medical thermometer before use.**

To force mercury down to the bulb.

☒ **What happens if: You put the clinical thermometer in boiled water.**

It explodes as its maximum scale is 42 and water boils at 100.



Comparison between the two types of thermometers;-

Points of comparison	**Celsius thermometers**	**Medical thermometers**
1) The scale:	From 0’C to 100 or 200 ‘C.	From 35 ‘C to 42 ‘C.
2) Constriction:	There is no constriction.	There is a constriction.
3) Uses:	Measuring the temperature of water and other liquids.	Measuring the human body temperature.
4) Shape:		Constriction

Why is mercury preferred in making thermometers?

- ✓ ***It is a liquid metal that can be seen easily through the thermometer glass.***
- ✓ ***Mercury is a good conductor of heat.***
- ✓ ***Mercury is a regular expanding material which gives an accurate estimation.***
- ✓ ***Mercury doesn’t stick to the walls of the capillary tube.***

Notes:-

The melting point of ice is 0C.

The freezing point of water is 0C.

The boiling point of water is 100C

Unit (3) Atmosphere

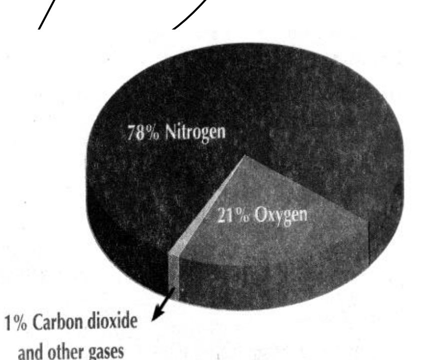
Lesson (1) **Oxygen**

The Atmosphere:-

- *composed of a mixture of gases (nitrogen – oxygen – carbon dioxide – water vapour and other gases)*
- *Surrounding the Earth.*
- *They are attracted to the Earth by the gravity.*

Ratios of gases in the atmosphere.

- *Nitrogen gas represents 78% of the total percentage of these gases.*
- *Oxygen gas represents 21% of air volume*
- *Other gases (water vapour, carbon dioxide other gases such as argon, neon, helium and others) represent 1% of air volume.*



Importance of the Atmosphere:-

1- *It protects the Earth by absorbing ultra violet radiation.*

2- *It adjusts the temperature of the Earth's surface.*

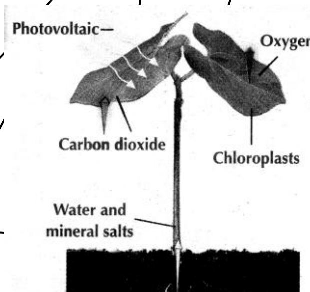
- *The atmosphere has large quantities of solid objects.*
- *The solid objects are dust particles, smoke and other gases produced by factories, cars, trains and ships.*
- *They help in the condensation of water vapour and falling in the form of drops of rain or snow.*

Oxygen

G.R.

The percentage of oxygen is constant although it is consumed in respiration and combustion?

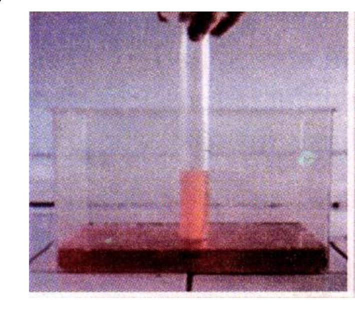
Because Green plants are the main source of oxygen in the air, during photo synthesis process



Oxygen gas exists in the atmosphere in a gaseous state.

Oxygen molecule consists of two oxygen atoms. O_2

Oxygen gas represents 1/5 of air volume.



Activity:

Set up the apparatus as shown.

Observation:

The candle puts off.

Water rises up in the cylinder with 1/5 of its volume.

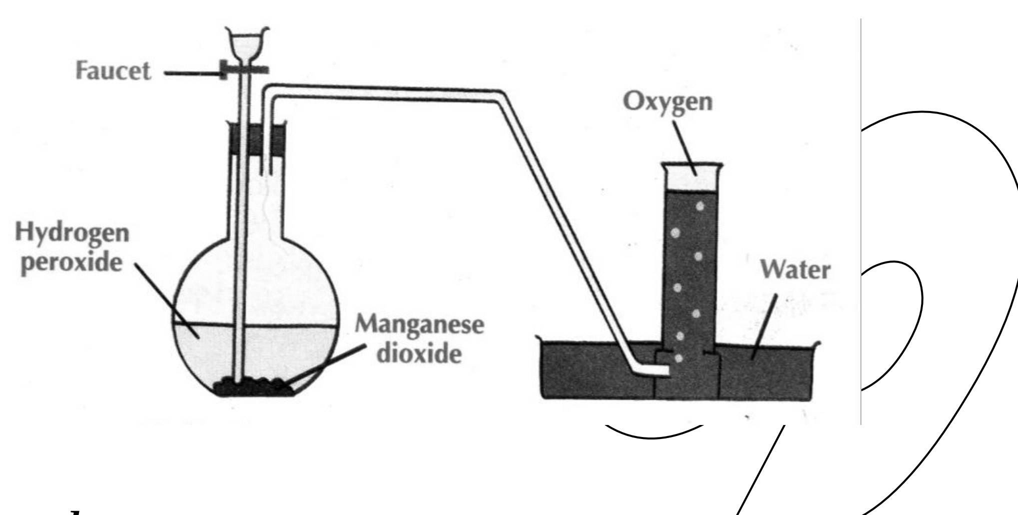
Explanation:-

Air is lost during candle burning, so water rises up to replace oxygen consumed.

Conclusion:

1- ***Oxygen gas helps in burning.***
2- ***Oxygen gas represents 1/5 of air volume.***

Preparation of Oxygen in the Laboratory



Observation:-

Bubbles are formed.

Conclusion:-

- *Hydrogen peroxide + Manganese dioxide (catalyst) → Water + oxygen*
- *Hydrogen peroxide dissociates in the presence of manganese dioxide (catalyst) into water and oxygen.*

Catalyst:

A substance that remains without change in quantity and properties during the chemical reaction.

Give reasons:-

Oxygen gas is collected by downward displacement of water.

Because:

a) Oxygen is scarcely (rarely) soluble in water.

b) Oxygen is lighter than water.

Properties of oxygen:-

1- Oxygen is colorless, tasteless and odorless.

2- It scarcely dissolves in water.

3- Oxygen does not burn, but it helps in burning

4- It has a neutral effect on litmus paper.

5- Oxygen is heavier than air as it replaces air.

6- Oxygen has the ability to combine directly with most elements to form oxides.

The Combination with Oxygen

A-**Burning:** ***(combustion)***

A rapid reaction of element with oxygen to produce heat and light.

Example: burning of cleansing wire to produce iron oxide.

B-**Oxidation:**

It is a slow reaction between element and oxygen in the presence of water.

Example: iron rusting.

What happens when?

You put a wet iron nail in a humid atmosphere for several days?

The wet iron nail rusts.

Give Reasons:-

a) We must paint ironware such as bridges pillars from time to another.

To protect it from rusting and erosion.

b) The cleaning wire becomes heavier after burning?

Because it combines with oxygen forming iron oxide.

The importance and uses of oxygen:-

G.R: Oxygen gas has a great importance to the human life.

1- It is important for respiration and food combusting inside living cells to produce energy.

2- Water consists of oxygen united with hydrogen.

Water consists of two hydrogen atoms and one oxygen atom.

3- Ozone (O_3) composed of three oxygen atoms.

- Ozone layer protects the Earth from harmful radiation that comes from the sun.

4- Oxygen gets compressed in iron cylinders and used in:

A- During surgeries.

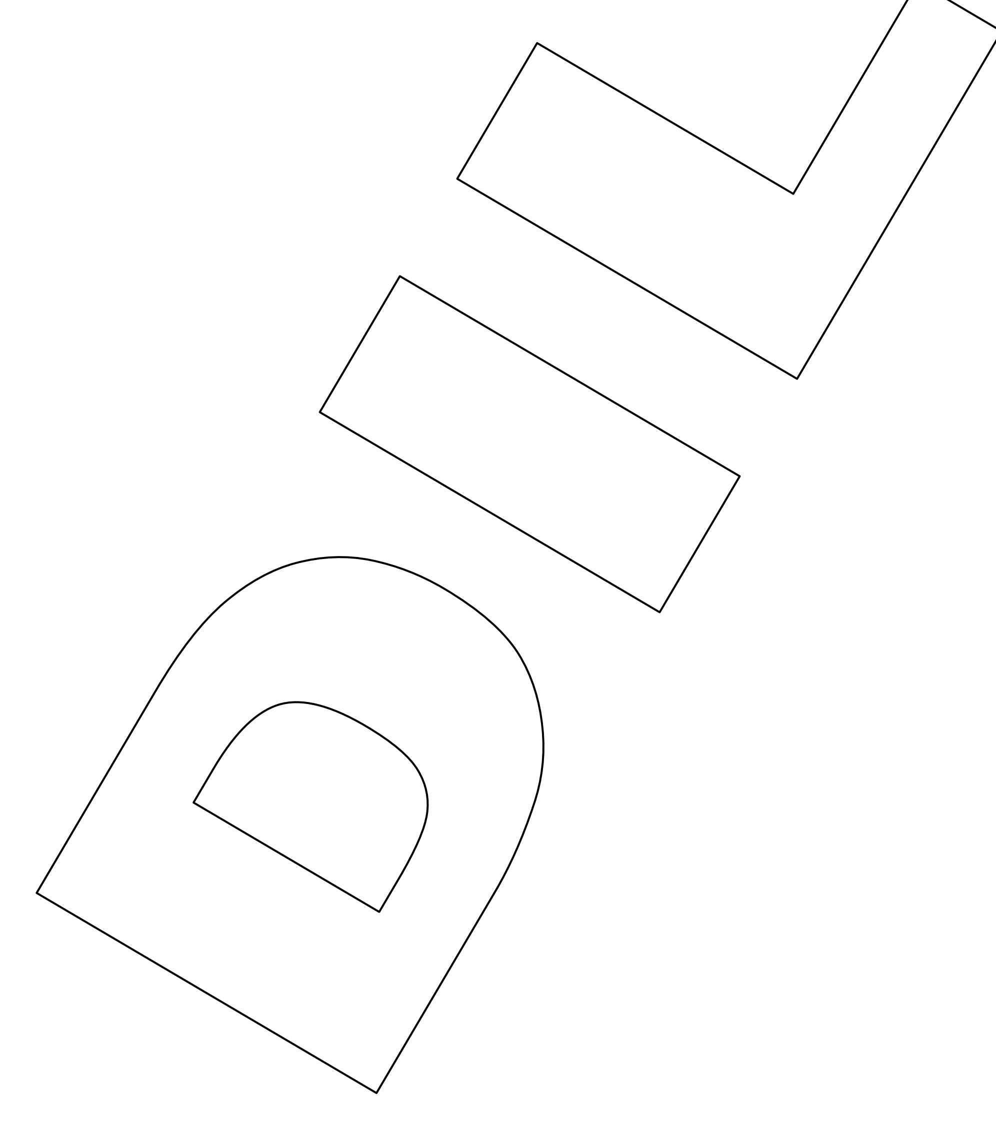
B- During diving and climbing mountains.

Because oxygen is heavier than air, so its ratio decreases as we go up.

C- Mechanical ventilation for patients who suffer from breathing difficulties

D- Oxygen is used in cutting and welding metals when combined with acetylene gas to produce oxy acetylene flame.

- **It has a temperature reaches 3500 C sufficient to melt metals.**



Lesson (2)

Carbon Dioxide

CO_2 Gas forms 0.03% of the volume of the atmosphere

Structure of carbon dioxide molecule (CO_2):-

Consists of one carbon atom and 2 oxygen atoms.

Carbon dioxide sources:-

It is produced as result of:-

1- Burning (combustion) of organic materials such as:-

(Wood – coal – oil – gasoline – tobacco)

2- Combustion of big amounts of fuel in factories, and means of transportation machines.

3- Respiration of all living organisms

- ***Lime water is used to detect CO_2 gas (G.R)***

- ***Because lime water turns milky (turbid) when CO_2 passes through it.***

G.R: Turbidity of lime water when CO_2 gas passes through it?

- Due to the Formation of Calcium carbonate which is insoluble in water

What happens when?

a) Blow exhaled air in a jar has clear lime water?

It becomes turbid

Activity: to detect CO_2 gas during the plant's respiration

Observation:- lime water turns milky.

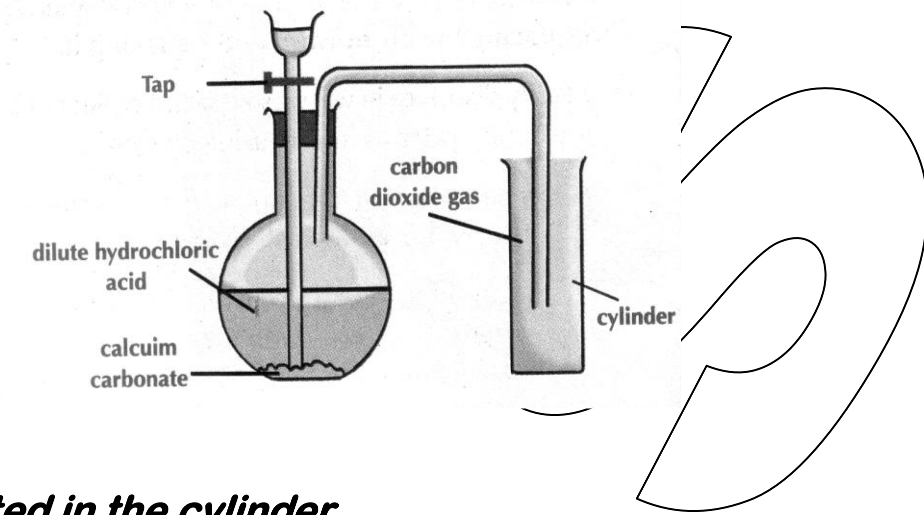
Conclusion: CO_2 gas is produced during respiration of plants.

What happens when?

b) Put a lighted candle in to a cylinder which has lime water.

Lime water turns turbid.

Preparation of CO_2 gas in laboratory



Observation:

CO_2 gas is collected in the cylinder.

Conclusion:

Calcium Carbonate reacts with dilute hydrochloric Acid to give (CO_2)

Give reasons:-

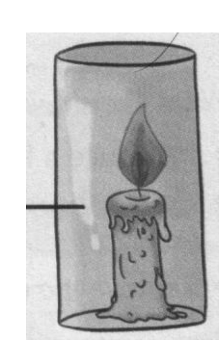
CO_2 gas is collected by displacing the air upward (G.R)

Because, it is heavier than the air.

G.R:- CO_2 gas is not collected by displacing the water?

Because, it easily dissolves in water.

Properties of CO_2 gas:-



1- ***CO_2 gas doesn't burn and doesn't help in burning, so it is used in extinguishing fires.***

2- ***A magnesium ribbon burns in the presence of CO_2 gas and turns into magnesium oxide (white powder) and black carbon (coal).***

Magnesium + CO_2 gas → Magnesium oxide (white) + Carbon (black)

3- ***CO_2 gas is colorless and odorless, gas.***

4- ***CO_2 gas is heavier than the air.***

5- ***CO_2 gas easily dissolves in water.***

Importance of CO_2 gas:

1- <u>It is used in refrigeration (G.R.)</u>

Because it converts into a liquid by pressure and cooling, then the pressure is relieved forming dry ice.

2- It is used in extinguishing fires (G.R.)

Because, it doesn't help in burning.

3- It is used to make soft drinks.

4- Green plants use CO_2 gas in photosynthesis process

To produce its food and oxygen.

5- It is used to make bread and cakes. (G.R.)

Because it makes the bread more porous and tasty.

What happens when we add yeast to hot water?

It produces CO_2 gas

G.R.:- yeast is added to the dough in making bread.

Because, it produces CO_2 gas during fermentation which makes the bread porous and tasty.

Disadvantages (harms) of CO_2 gas:-

The removal of forests leads to the increase in CO_2 gas percentage in air that causes harm to the climate such as

a- Increasing the temperature of Earth.

b- Melting of snow at the two poles that causes the raise of water level

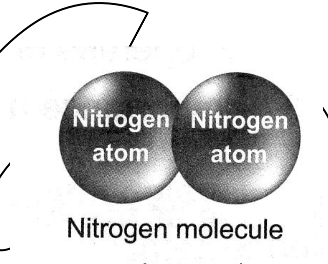
That happens if : -

1- *The percentage of CO_2 gas in the air increases.*
2- *The percentage of CO_2 gas in the air decrease.*

Lesson (3)

Nitrogen

Found in nature in a gaseous state



Structure of nitrogen:-

- *Composed of two nitrogen atoms*
- *Has the symbol of N_2.*
- *Nitrogen is called azote (lifeless) Because it is inactive gas as*
  - *a) It doesn't help in burning.*
  - *b) It is not included in respiration process.*

- *The scientist **Daniel Rutherford** discovered nitrogen in 1772.*

The existence of nitrogen:

1- N_2 gas represents 78% of air volume.

2- N_2 gas enters in the composition of all living tissues in the living organisms.

Because it Forms protein which is used for building the living cells.

3- The legumes such as clover peas and soybeans have a type of bacteria called nodular bacteria that live in their roots.

- ***This type of bacteria fixes the nitrogen gas from air inside the soil which is used in making protein.***

What happens: there are no nodular bacteria in the root of legumes.

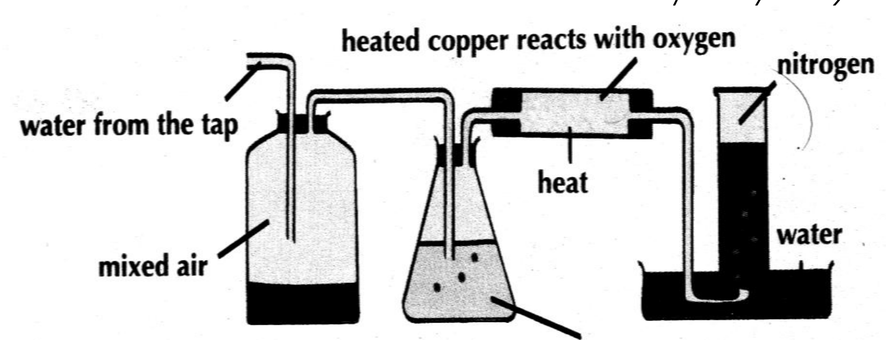
4- Nitrogen reacts with atmospheric oxygen during lightning forming nitrogen oxides Nitrogen + Oxygen → Nitrogen oxide.

Preparation of nitrogen in laboratory

Depends on the removal of CO_2 and oxygen gases from the atmospheric air, then nitrogen gas is collected.

G.R:- the main source of nitrogen preparation is the air.

- Because, N_2 gas is 78% of air volume.



Set up the apparatus as shown in the previous figure.

1- During preparation of nitrogen gas, air passes over sodium or potassium hydroxide.

To absorb the small amount of CO_2 gas from the air.

2- During preparation of nitrogen gas, air passes over hot copper?

To remove oxygen from the air as the hot copper combines with oxygen.

3- Nitrogen gas is collected by downward displacement of water?

- ***Because Nitrogen is scarcely soluble in water.***



Properties of Nitrogen

1- It is colorless, tasteless and odorless gas.

2- It scarcely dissolves in water.

3- It doesn't help in burning.

4- What happens when:-

a) A lighted magnesium ribbon is placed in a cylinder filled with nitrogen gas, then adding some drops of water?

Magnesium + nitrogen gas → white substance →water → ammonia gas.

b) A red litmus paper is exposed to ammonia gas.

- ***Ammonia has alkaline effect on litmus paper as litmus paper turns blue.***
- ***Ammonia gas has a pungent smell.***

5- Nitrogen gas can be condensed in to liquefied nitrogen.

6- It doesn't easily react with a lot of other elements.

Importance and use of nitrogen.

1. Nitrogen gas is used in filling car tires.

Because its volume doesn't change by changing the temperature.



2. Liquid nitrogen is used in :-

a- Treatment for skin tumors

b- Preserving and transfer the food (G.R.)

Because, it makes food freeze quickly when nitrogen changes into liquid at a very low temperature.

3. It is used in manufacturing of ammonium nitrate and ammonia to produce fertilizers.

4. It is used to store petroleum and flammable materials (G.R.)

Because nitrogen is an inactive material. (Doesn't help in burning)

5. It is used to fill some types of lamps.

6. used in making:-

Gun powder – electronic devices – stainless steel

Unit (4)

Lesson (1)

Human Nervous System

Definition:-

- ***A communicating and controlling system that receives information to give a suitable response.***

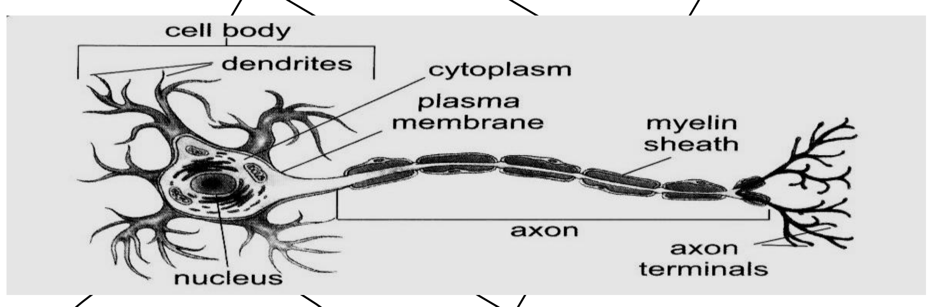
The importance of nervous system:-

1. **Let you sense hotness, coldness.**
2. **Knowing things sweet, bitter, rough and smooth.**
3. **Adjust your movement.**
4. **Thinking and learning.**
5. **Adjusts emotions *(happy, sad, angry and calm)***

The Nerve Cell (Neuron)

Definition:-

The basic structure unit of the nervous system.



The structure of the neuron:

a) The Cell Body:

1. **Nucleus – cytoplasm – plasma membrane.**
2. **Dendrites branches extending from the cell body connected to neighbouring neurons composing synapse (synaptic area).**

b) The Axon:-

Cylindrical axis covered with fatty layer called myelin sheath to end with nerve endings (axon terminals).

Function of axon terminals:

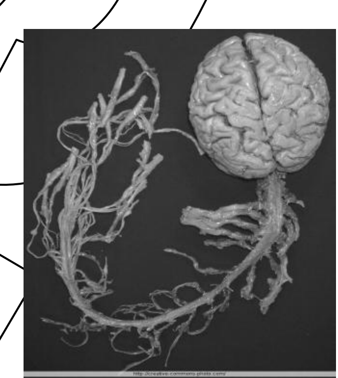
Connected to muscles or form a synapse with other neurons.

The Structure of the human nervous system

☒ **Central Nervous System.**

☒ **Peripheral Nervous System.**

First: The Central Nervous System



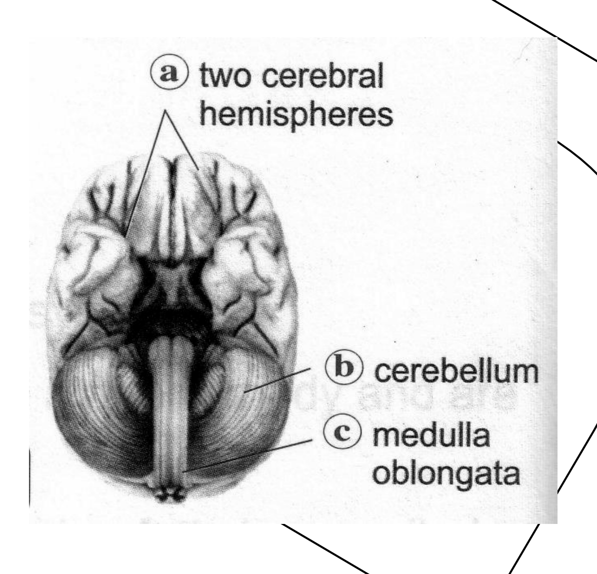
Definition:-

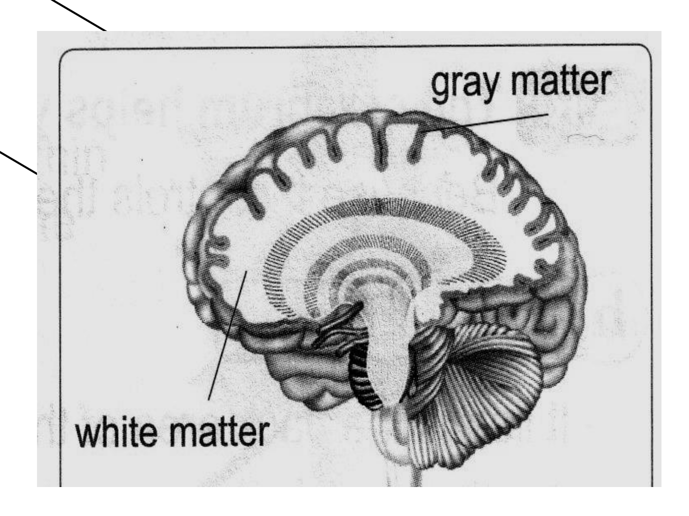
The system that consists of the brain and the spinal cord.

A) The brain:-

- **The main control center in your body, it directs and coordinates all processes – ideas – behaviors – emotions.**
- **The brain is located inside a bony box called the skull to protect it .**
- **The brain is a nerve block containing millions of nerve cells.**

The structure of the brain:-





Point of comparison	Cerebrum	Cerebellum	Medulla Oblongata
1) structure and location	*The largest part of the brain.* *It's divided into a right and left halves called cerebral hemispheres* *The outer part is called* ***cerebral cortex*** *which is the grey matter. But the inner part is the white matter.*	*Lies at the back area of the brain below two hemispheres.*	*In front of the cerebellum it connects the brain with the spinal cord.*
2) function	*a) Controls the voluntary movements of the body like running.* *b) Receives nerve impulses from sense organs (eyes, ears, nose, and tongue, skin) to gain suitable response.* *c) Contains centers of thinking and memory.*	*Maintains the balance of the body during movement.*	*Regulates the involuntary processes of the body like:-* ❖ *Regulating the heart beats.* ❖ *Regulating the movement of respiratory system during breathing.* ❖ *Regulating the function of digestive system.*

Define the Cerebral Cortex:-

The outer surface of the hemispheres that has grey colour.

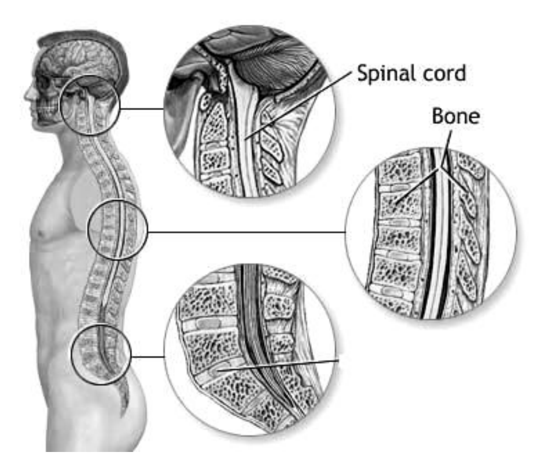
Give reasons:-

a. ***The hemispheres are characterized by having many convolutions and folds in their surfaces.***

To increase the surface area and having more nerve cells.

b. ***Damage of medulla oblongata causes death.***
Because medulla oblongata regulates the involuntary actions like heart beats and breathing.

B) Spinal Cord:-





A cylindrical nerve cord extends from the brain passing through a channel in the back bone for protection.

Structure of the Spinal Cord:-

Internal substance called grey matter that appears in the shape of letter H surrounded by the white matter.

The function of the Spinal Cord:-

a) It delivers nerve messages from the body organs to brain and vice versa.

b) It is responsible for the reflexes such as the withdrawal of the hand quickly on touching a hot surface

Compare between:-

Point of comparison	Spinal cord	Two cerebral hemispheres
Structure:-	*It consists of:* *a) Internal grey matter having the letter H shape.* *b) External white matter.*	*It consists of:* *a) Internal white matter.* *b) External grey matter that surrounds the white matter.*

Second: The Peripheral Nervous System

The nerves which emerge from the central nervous system.

These Nerves are:

Cranial Nerves	Spinal Nerves
12 pairs of nerves emerged from the brain to organs in the face.	***31 pairs of nerves emerge from the spinal cord. They emerge to other body organs.***

The function of peripheral nervous system:-

Getting sensory information and kinetic responses between central nervous system and all parts of the body.

The Reflex Action

Automatic (involuntary) response by nervous system to external stimuli.

Examples:-

a) ***Withdrawing the hand quickly when touching a hot surface.***
b) ***Blinking when something gets close to the eye.***
c) ***Secretion of digestive juices when seeing food.***
d) ***Constriction of the eye pupil in intense light.***
e) ***Sweating on hot days.***

How does reflex action take place:-

1) ***When you touch a sharp thorn, the sever thorns affect the nerve endings in the fingers causing nerve impulses.***
2) ***Nerve impulses are transmitted to spinal cord through sensory nerve fibers.***
3) ***Spinal cord transmits nerve impulses to arm muscles through motor nerve fibers, so muscles contract and arm withdraws away.***
4) ***Other nerve impulses are sent from the spinal cord to the brain leading to the true sense of pain.***

Ways of maintaining the human nervous system:-

1) ***Reducing the intake of stimulating substances such as coffee and tea.***

   Because they affect sleeping hours and heart beats causing nervous tension.

2) ***Staying away from tranquilizers and stimulants.***

3) ***Not exhaust the sensory organs by sitting for periods in front of computers and television.***

4) ***Giving the body sufficient period of rest – sleeping.***

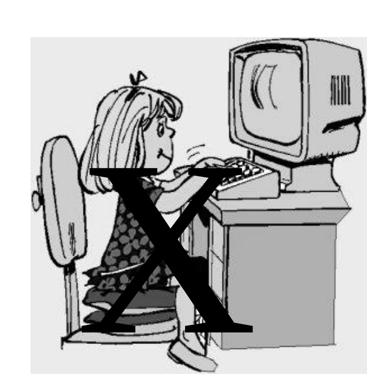
5) ***Being away from sources of pollution and noises places.***

6) ***Doing physical exercises.***

7) **Staying away from addiction because it passively affect on the nervous system as:**

- **Retardation of memory and learning.**
- **Nervous tension.**
- **Sluggishness.**
- **Loss time sensation.**
- **Sleepless.**







The Human Locomotory System

Define Movement:-

The ability of the organism to change its position from a place to another.

One of the characteristics that distinguish living organisms from non-living things.

The structure of the Locomotory system



Skeletal System

Muscular System

A) The Human Skeletal System:-

- ❖ ***The Axial Skeleton.***
- ❖ ***The Appendicular Skeleton***

The Axial Skeleton

Point of comparison	The skull	Back bone	The Rib Cage
1) Shape			
2) Structure	A bony box that contains cavities for eyes, nose and ears.	The axis of the skeleton 33 vertebrae with cartilages between them.	12 pairs of ribs that first ten pairs are connected interiorly from the front to the sternum. (breast bone)
3) function	Protects the brain	a) Allows the body to bend in different directions. b) Protects the spinal cord inside.	a) Protects the lungs and the heart. b) Helping in inhalation and exhalation process.

Give reasons:-

a) There are cartilages between vertebrae of the vertebral column.

To prevent friction between vertebrae during motion.

b) The last two pairs of ribs in the rib cage aren't connected to the sternum.

To increase the surface area of the chest helping in inhalation and exhalation.

The Appendicular skeleton

It consists of the bones of upper and lower limbs:-

Point of comparison	Bones of upper limbs	Bones of lower limbs
Shape:		
Structure:	**Humerus bone, forearm bones and hand bones.** **It is connected to the shoulder bone.**	**Femur, shaft bones and foot bones.** **It is connected to the pelvic bones.**
Function:	**Allow eating, drinking writing and holding things.**	**Allow walking, running, standing, sitting and carrying the rest of the body.**

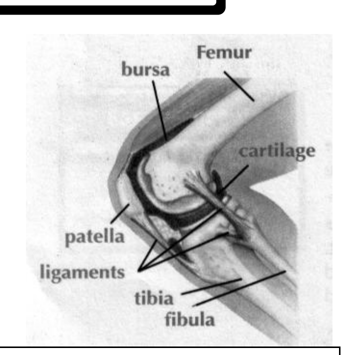
Joints and their significance to movement

✓ ***The locations at which the bones meet each other.***

The human can't move if all of his bones are fused together.

✓ ***The importance of joints.***

Allow the movement between the bones.



Types of joints:-

Immovable joints	Slightly movable joints	Freely movable joints
They don't allow any movement.	**They allow movement in one direction only.**	**They allow movement in all directions.**
Such as: **Joints between bones of skull.**	**Such as:** **Knee and elbow joints.**	**Such as:** **Thigh – shoulder – wrists joints.**

B) The Muscular System:-

- ✓ The engine of our body.
- ✓ Muscles generate mechanical energy and movement to the body.
- ✓ Movement is generated by the ability of muscular cells to contract and relax.
- ✓ Muscles are fixed to bones by long strips called tendons.

Types of muscles:-

Voluntary muscles	Involuntary muscles
Muscles move willingly (Under your control).	Muscles work automatically and you can't control their motion.
Like: limbs, truck, face and Abdominal wall.	Like:- Gastrointestinal tract. Blood vessels. Bladder muscles.

The Role of Muscles in the Movement of Hand Wrist:-

Moving lower arm towards upper arm	Moving lower arms away from upper arm
• The front muscles contracts. • The back muscle relaxes.	• The front muscle relaxes. • The back muscle contracts.

How to maintain your locomotory system:-

1) Commitment of vaccinating children against children polio.
2) Eating healthy food rich in calcium, phosphorous and vitamin D.
3) Avoid behaviours lead to fractures and sprains such as jumping from high places and violent movement.
4) Avoid carrying heavy things that exceed your ability to protect the backbone.
5) Sitting and standing correctly during studying or reading to avoid straining the neck or back bone vertebrae.
6) Exposing the body to sunlight for suitable periods due to the importance in providing the body with vitamin D.
7) Do physical exercise regularly.